REFERENCE 4

INEL
Idaho National Engineering Laboratory

From FAH-06-86
F. A. Hohorst
Phone 6-4542/ILF-107
Date March 3, 1986
Subject: Second Interim Report on Radiological Residues from the CFSGF

Reference: F.A. Hohorst, letter FAH-20-85, to G.J. McManus, "Interim Report on Radiological Residues from the CFSGF", dated October 21, 1985.

To G. J. McManus, Supervisor
Monitoring Technology

cc: T. W. Chesnovar
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An earlier letter (Reference) provided estimates of the increase in the radionuclide inventory and associated volume of waste discharged to the CFSGF ash pit during FY-85. The estimates were based on typical, published compositions of coal/limestone and the amounts of coal/limestone consumed during FY-85. The study indicated that the radionuclide inventory increased by 0.13 Ci and the volume of waste increased by 5100 m^3 in FY-85.

Subsequently, new estimates of the total radionuclide inventory and associated waste discharged to the ash pit for the period April 1984 through October 1985 were prepared. These estimates were based on examination of design and operating data and analyses of coal, limestone and ash from the facility. More specifically, the new estimates were derived from the actual sample analysis data (Table 1), the volumes of ash stored at the waste disposal area (Table 2, Figure 1) and a mass/activity balance of the coal, limestone, and ash (Tables 3 and 4).

The results of the study are presented below:

1. The discharge of ash via the CFSGF Stack is approximately 3.8×10^7 grams per year or approximately 1 percent of the total ash generated.

2. The total radionuclide inventory and volume of waste discharged to the CFSGF waste disposal area for the period April 1984 through October 1985 were 0.17 Ci and 11,000 cubic meters, respectively. Of the total radionuclide inventory, the ^{232}Th, the ^{238}U, and the ^{235}U decay series of radionuclides, assuming secular equilibrium and a natural isotopic abundance of ^{235}U, contribute 0.029 Ci, 0.14 Ci and 0.0055 Ci, respectively.

3. The mass/activity balance indicated the abundance of the two major radionuclides, ^{232}Th and ^{238}U, present in the coal and limestone versus the abundance of them in the resultant ash agreed to better than 90 percent. As a result, future annual projections of the radionuclides discharged to the ash pit can be obtained from the amounts of coal and limestone consumed at the CFSGF and the sample analysis data of Table 1. It should be noted, however, that this method to obtain projections of radionuclide releases to the ash pit is only valid for the current supplier. If a different supplier is selected in the future, the collection and analysis of additional samples should be performed.

4. A review of the Environmental Impact Assessment for the CFSGF indicated the density of ash employed in the design of long term storage capacity of the ash pit (1556 kg m^{-3}) is significantly greater than the density of ash now stored at the waste disposal area (715±15 kg m^{-3}). This discrepancy should be examined due to its potential impact on future ash disposal at the ICPP.

5. Since the inventory of radionuclides at the ash pit is small in comparison to other sources of solid waste, further characterization is not warranted. An annual review of the waste discharged to the ash pit, however, seems prudent. If you concur, I will proceed to compile a summary of the waste discharged to the ash pit on an annual basis.

If you have any additional questions, please call me at 6-4542

Frederick A. Hohorst

Frederick A. Hohorst, Scientist
Monitoring Technology

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Attachments

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TABLE 1

Gamma Analyses of CFSGF Samples

		Radionuclides (±% 1 sigma)		
Sample Description	Mass (g)	^{40}K ($pCi\ g^{-1}$)	^{232}Th[a] ($pCi\ g^{-1}$)	^{238}U[b] ($pCi\ g^{-1}$)
Coal	767	---	0.12 (6)	0.44 (12)
Limestone	1730	0.73 (15)	0.011 (14)	0.10 (25)
Northwest ash	361	---	0.35 (7)	1.3 (22)
North side ash	933	0.80 (30)	0.32 (6)	1.4 (12)
South side ash	803	3.0 (19)	0.45 (5)	1.5 (16)
Soil near perimeter	760	20. (7)	1.4 (4)	2.5 (12)

a Calculated from a weighted average of the thorium-232 progeny based upon the square of the error.

b No weighted average was computed because of the variable (46-60%) loss of radon-222 from the substrate.

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TABLE 2

Volume of CFSGF Ash Pit Waste

Area	Description	Time Used	Volume (m^3)
C1	Truck discharging area	Present	7300
C2	Accumulation area	Present	2300
C3	Startup ash dump	1984	840
C4	Dump from experimental tests	1984	60
C5	Dump from experimental tests	1984	4
C6	Dump from experimental tests	1984	1
	TOTAL		11000

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FIGURE 1

CFSGF Ash Pit Waste Locations
(From EG&G Photograph 85-219-1-1, May 20, 1985)

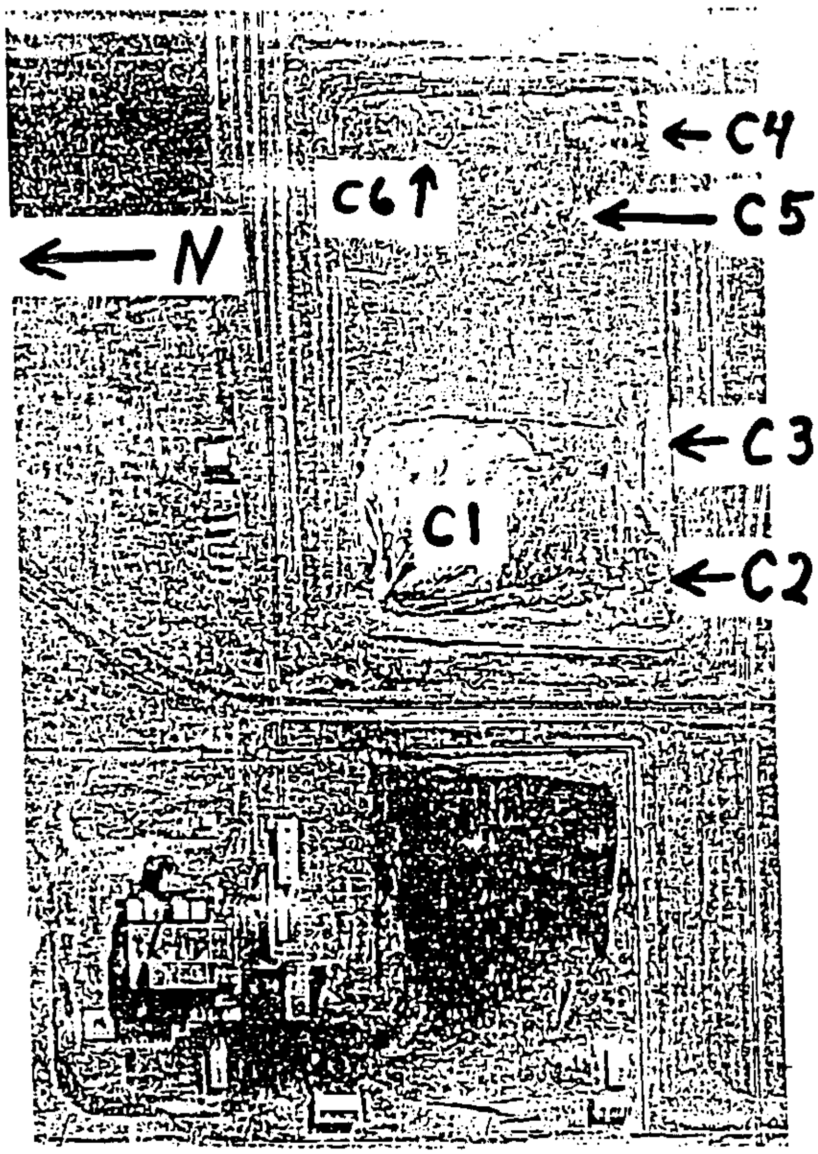

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TABLE 3

FY-85 Mass Balance for Thorium-232 at CFSGF

Coal Consumed	$= 1.19 \times 10^{10}$ g	
Coal Assay	$= 1.2 \times 10^{-13}$ Ci g-1	
Coal Contribution		$= 1.4 \times 10^{-3}$ Ci
Limestone Consumed	$= 2.77 \times 10^{9}$ g	
Limestone Assay	$= 1.1 \times 10^{-14}$ Ci g-1	
Limestone Contribution		$= 3.0 \times 10^{-5}$ Ci
TOTAL Thorium-232 Calculated		$= 1.4 \times 10^{-3}$ Ci
Ash Calculated	$= 3.60 \times 10^{9}$ g	
Ash Assay Observed	$= 3.7 \times 10^{-13}$ Ci g-1	
TOTAL Thorium-232 Observed		$= 1.3 \times 10^{-3}$ Ci
Percent Difference		= 7%

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TABLE 4

FY-85 Mass Balance for Uranium-238 at CFSGF

Coal Consumed	= 1.19×10^{10} g	
Coal Assay	= 4.4×10^{-13} Ci g-1	
Coal Contribution		= 5.2×10^{-3} Ci
Limestone Consumed	= 2.77×10^{9} g	
Limestone Assay	= 1.0×10^{-13} Ci g-1	
Limestone Contribution		= 2.8×10^{-4} Ci
TOTAL Uranium-238 Calculated		= 5.5×10^{-3} Ci
Ash Calculated	= 3.60×10^{9} g	
Ash Assay Observed	= 1.4×10^{-12} Ci g-1	
TOTAL Uranium-238 Observed		= 5.0×10^{-3} Ci
Percent Difference		= 9 %